Electric Vehicle Scenarios for India

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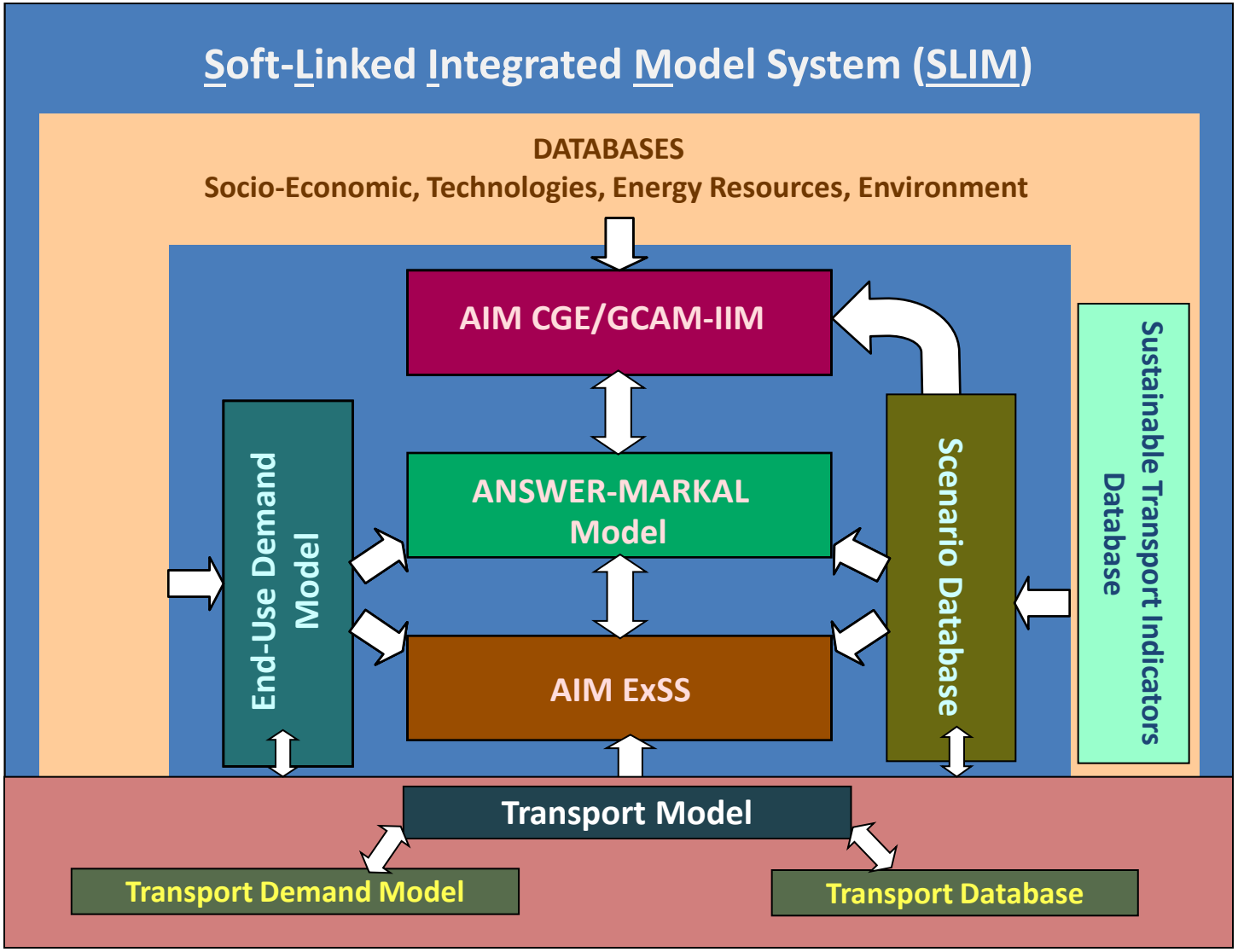
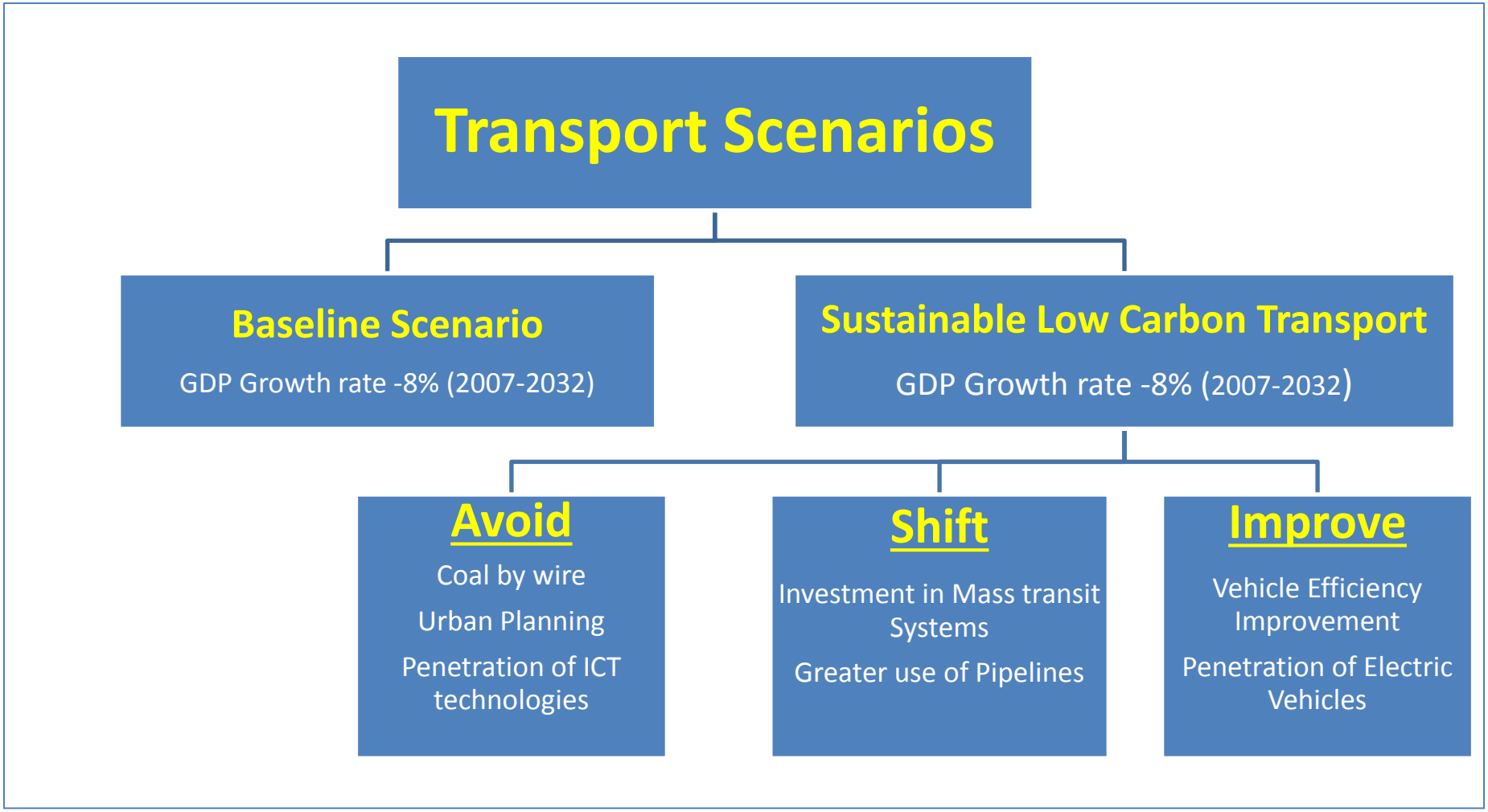
Presentation Agenda

1. Low Carbon National Transport Modeling Assessment
   - *Model System*
   - *Scenarios Architecture*
2. National Passenger Transport Demand
3. Sustainable Low Carbon Transport Scenario
   - *Energy Demand*
   - *CO_2 Emission Mitigation*
   - *Air Quality Co-benefits*
4. Electric Vehicle (EV) Scenarios
5. Conclusions

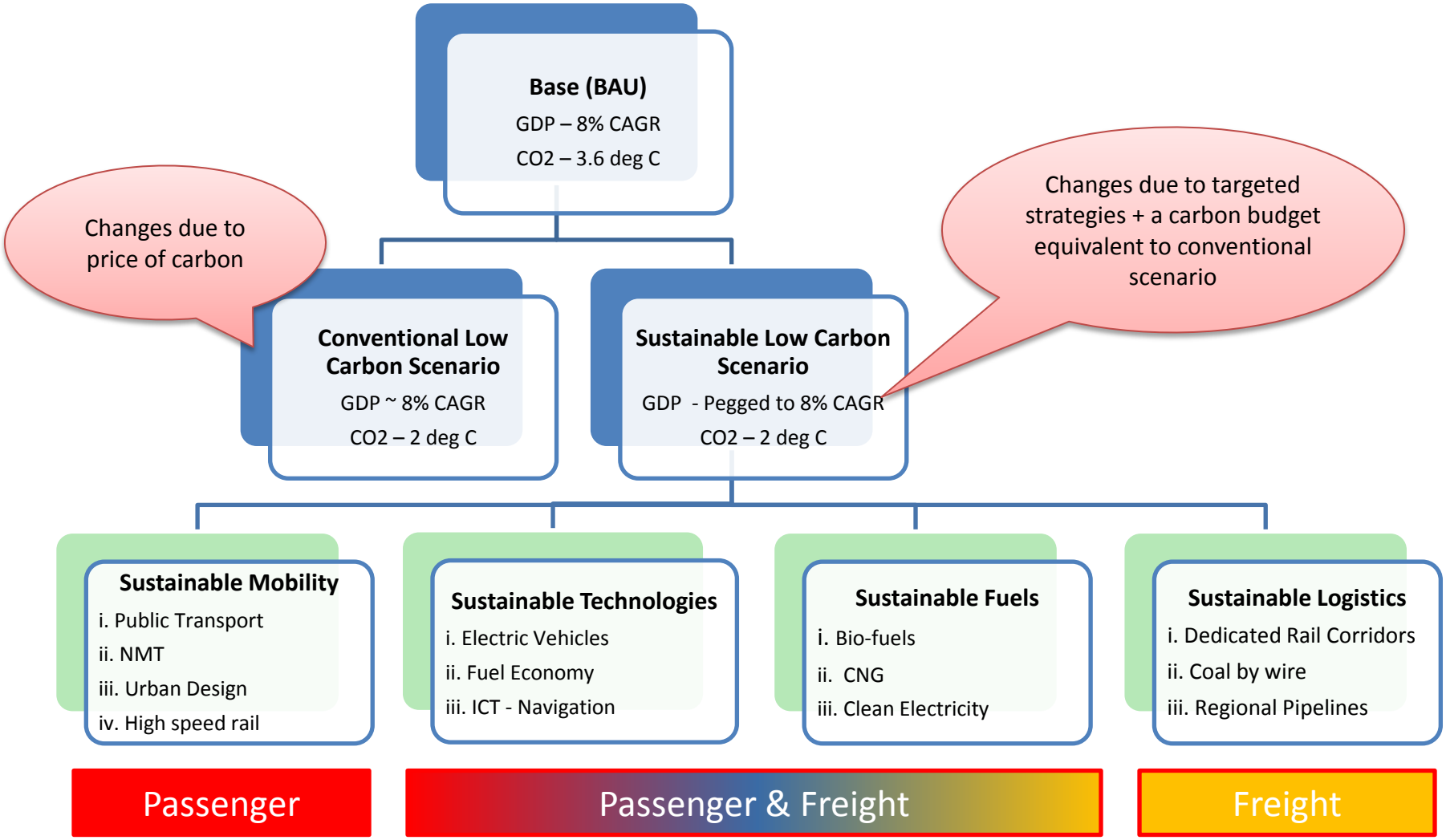
Soft-Linked Integrated Model System



Scenario Paradigm



Transport Scenarios Architecture

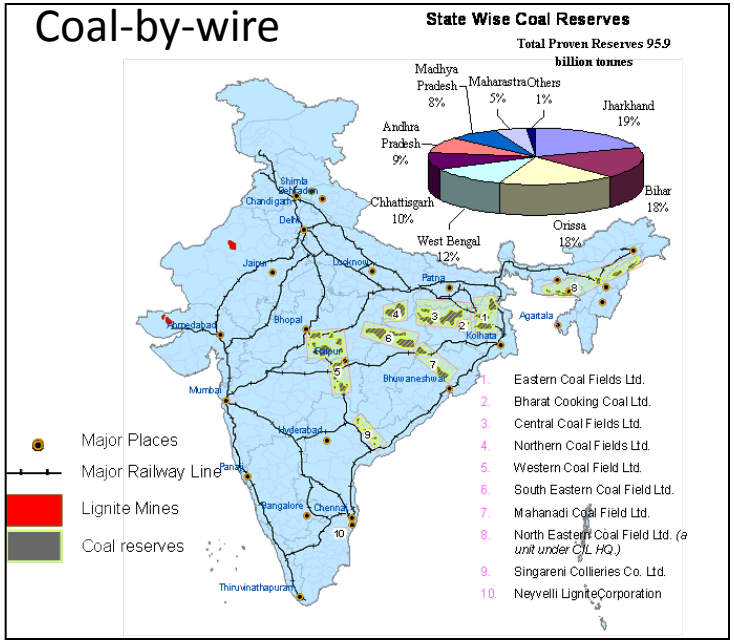


Sustainable Mobility Storyline

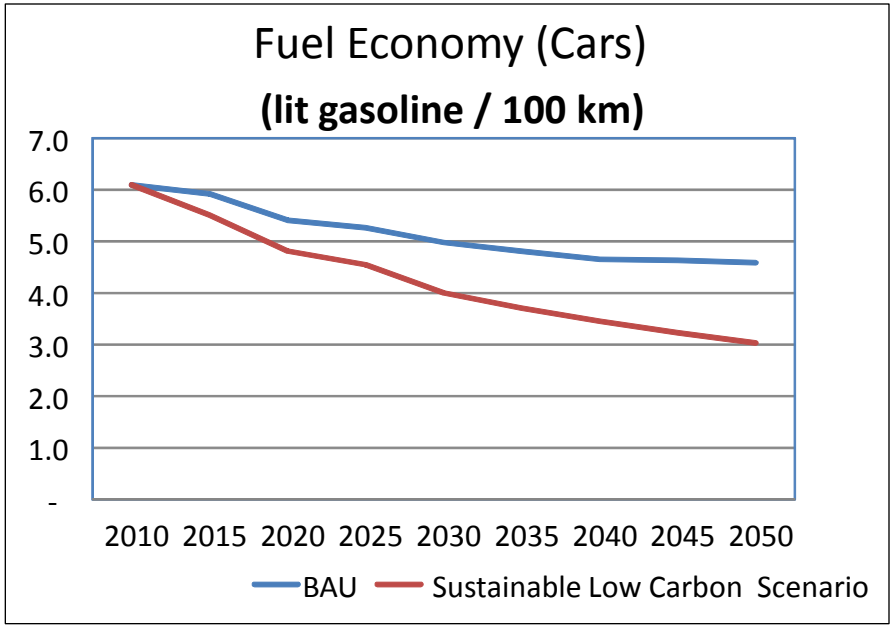
Non-Motorized Transport

Pipe Transport

Coal-by-wire



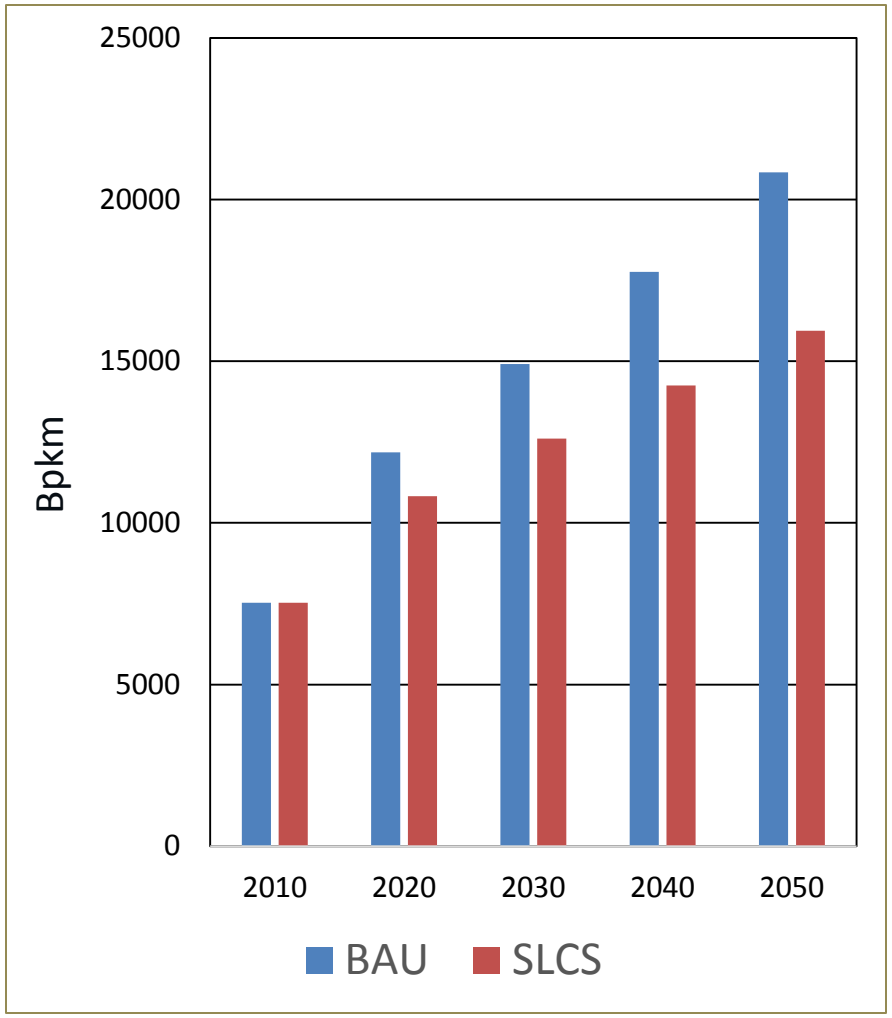
Fuel Economy (Cars)



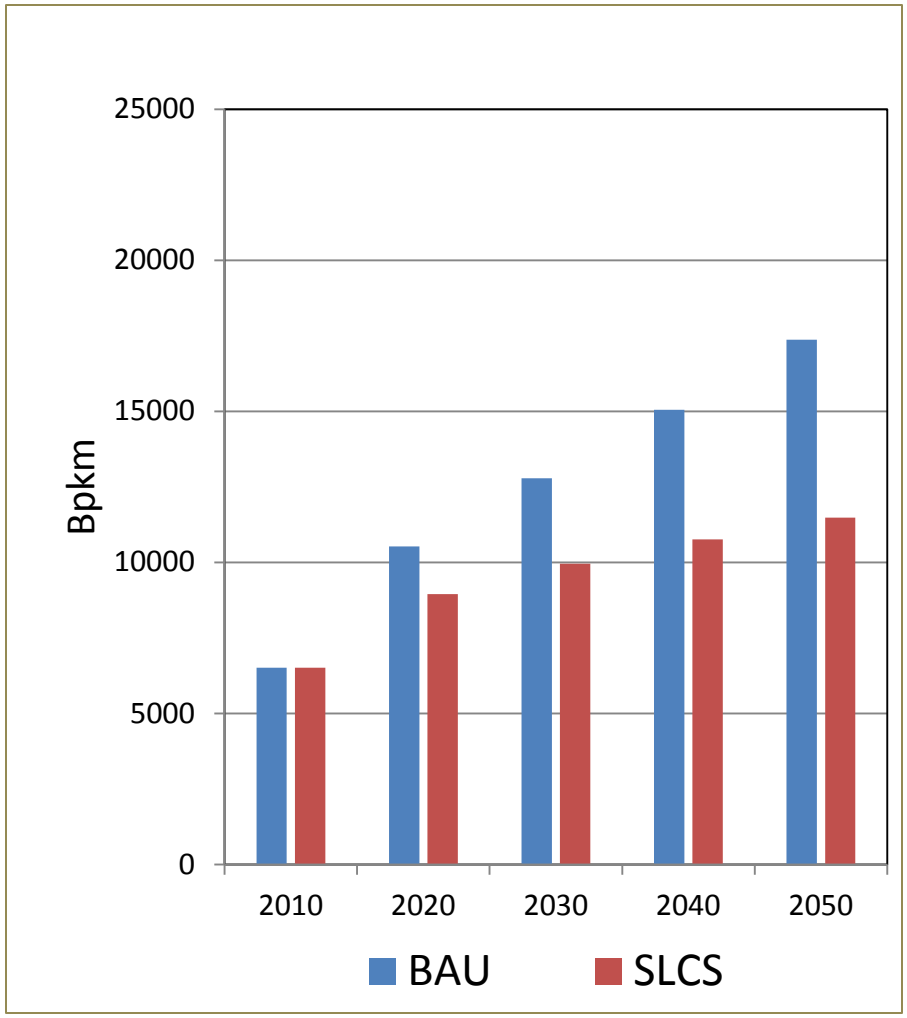
National Passenger Transport Demand in Scenarios

Passenger Transport Demand

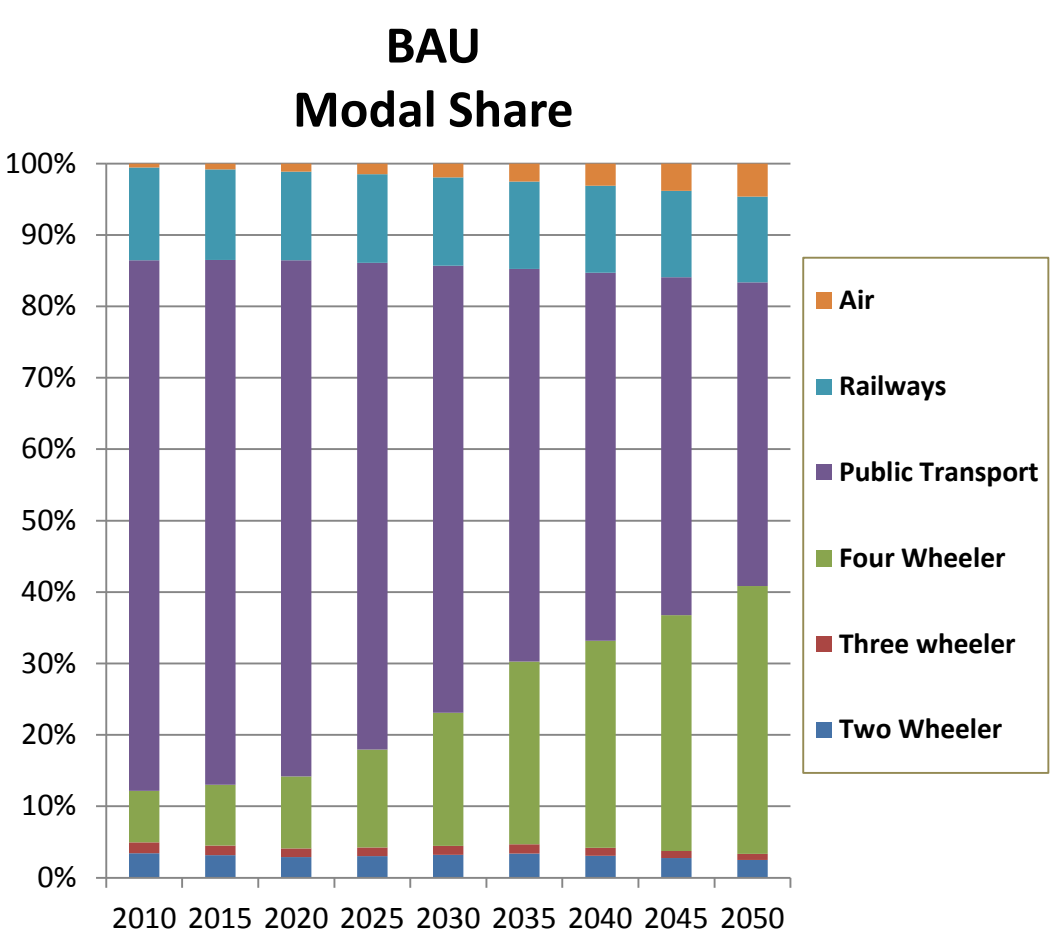
BAU - Passenger Transport Demand

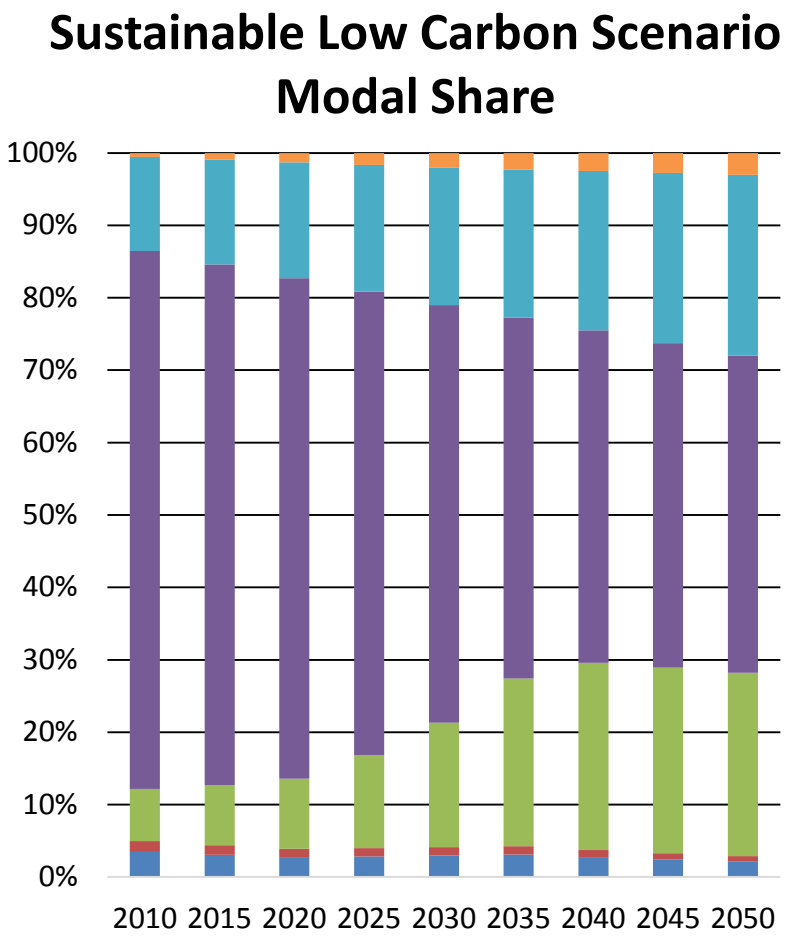


BAU - Road Passenger Transport Demand

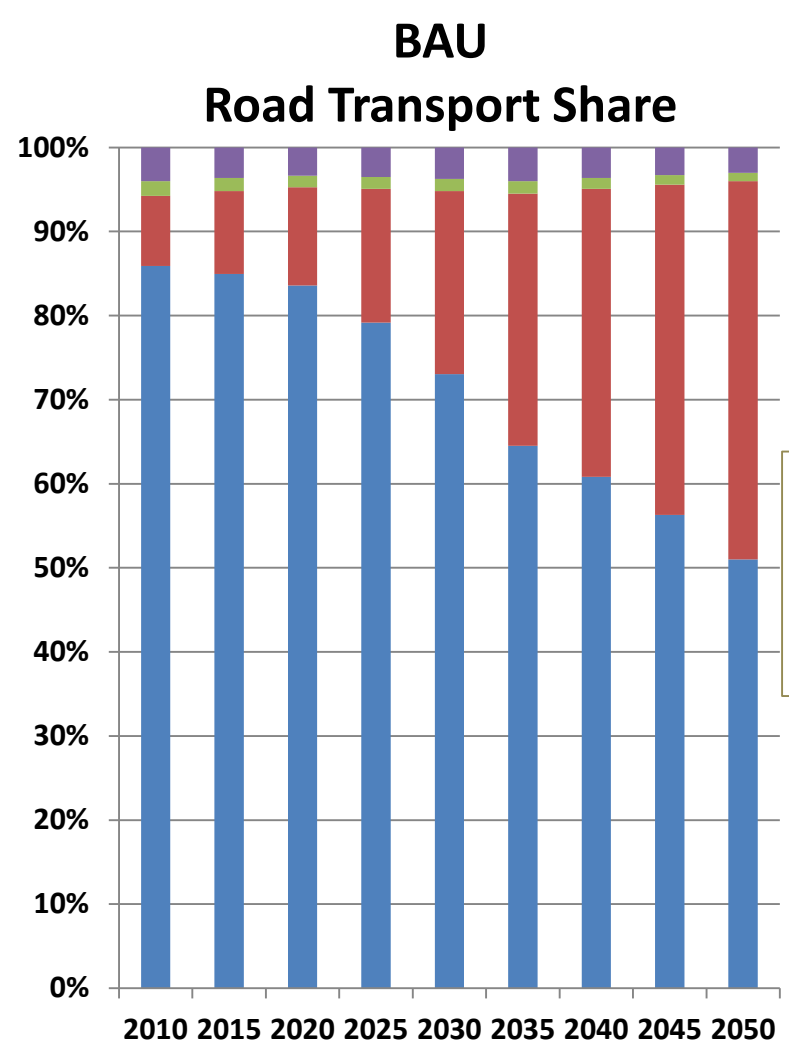


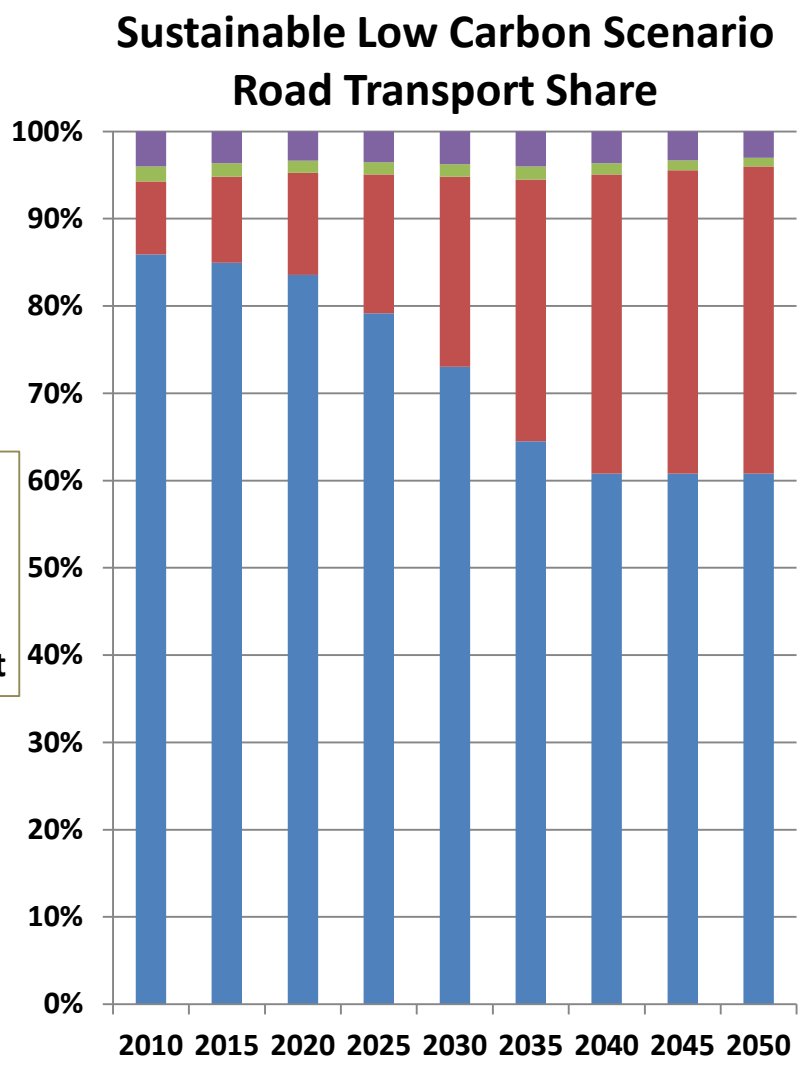
Modal Share of Passenger Transport





Share in Road Passanger Transport

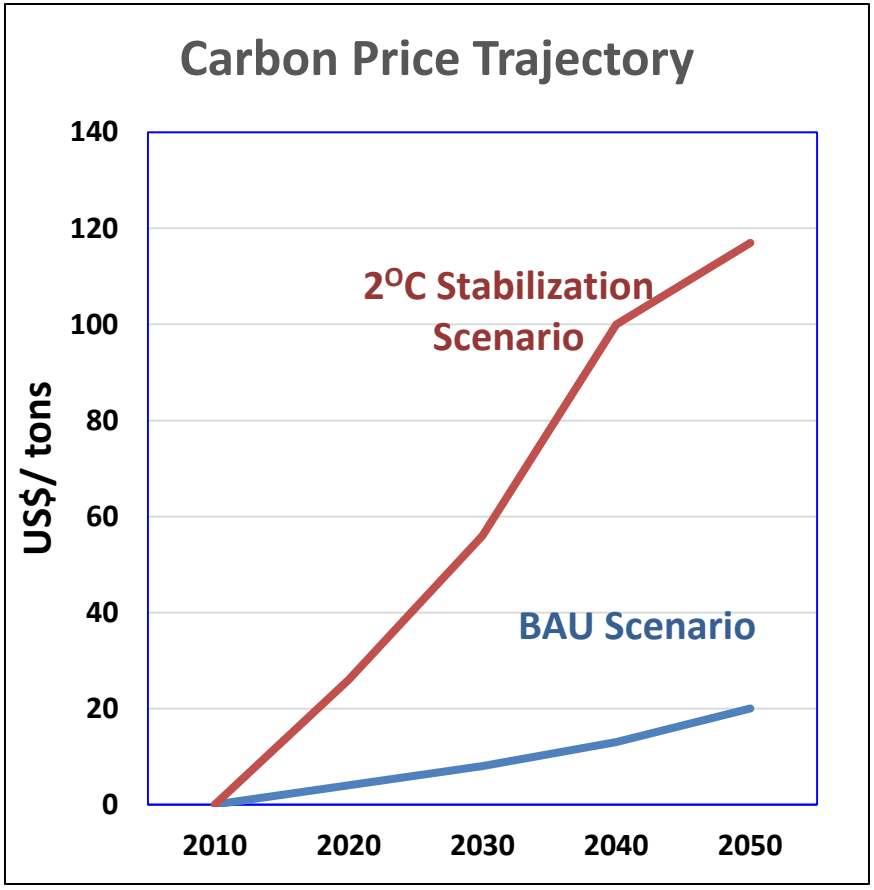


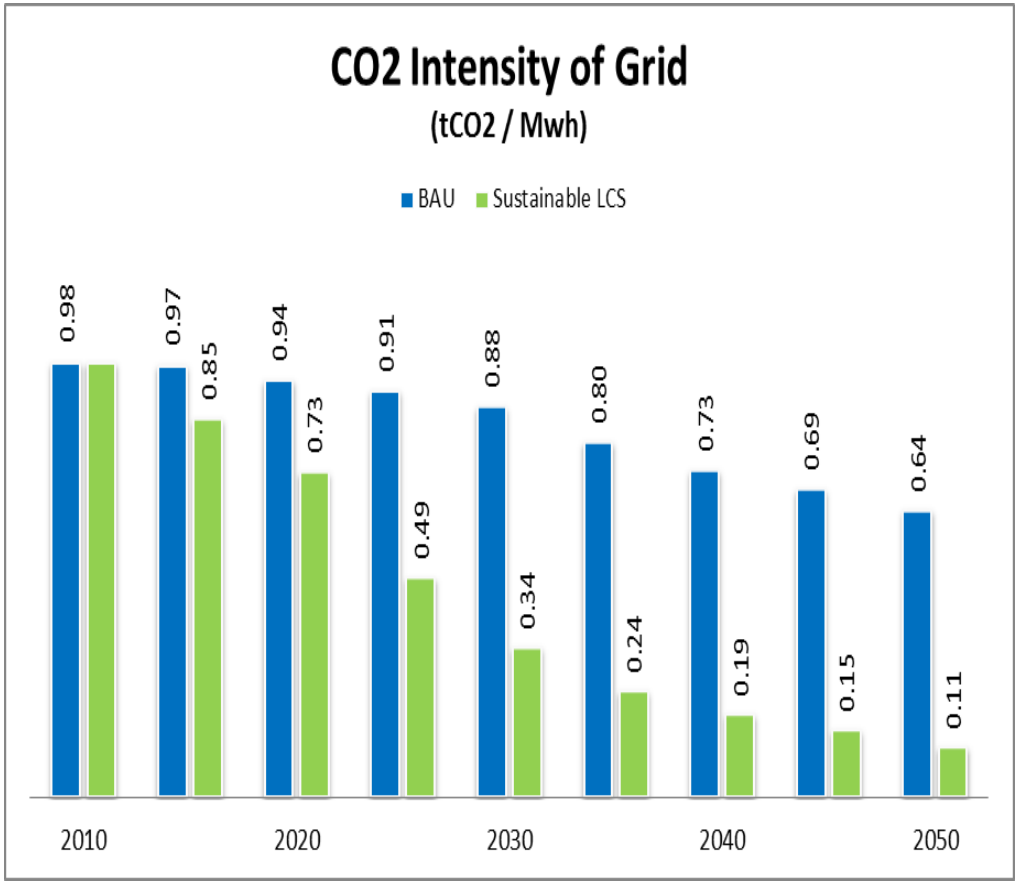


Sustainable Low Carbon Transport Scenario

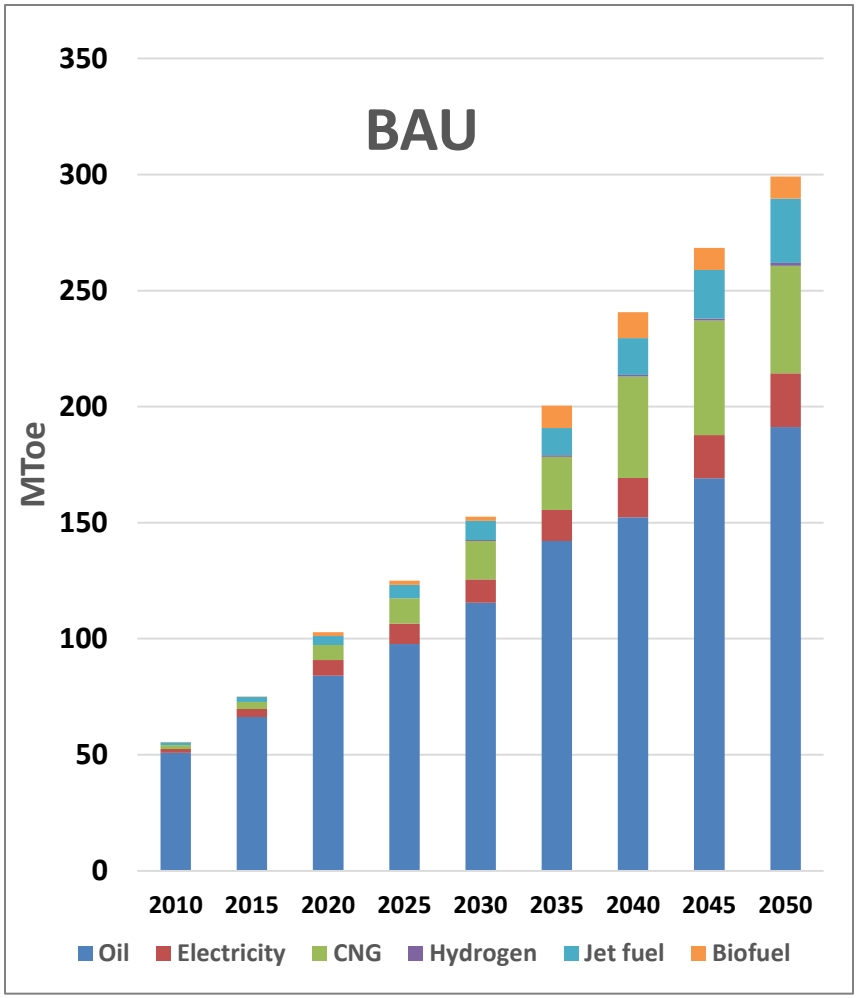
Results from Modeling Assessment

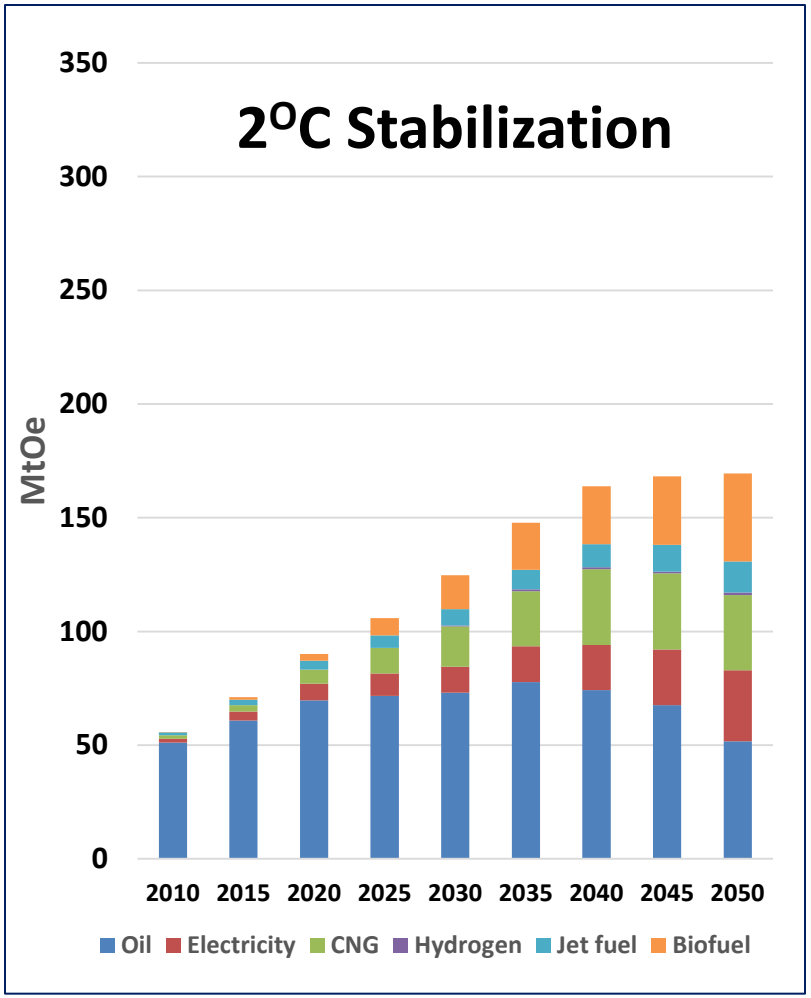
Low Carbon Electricity Transition





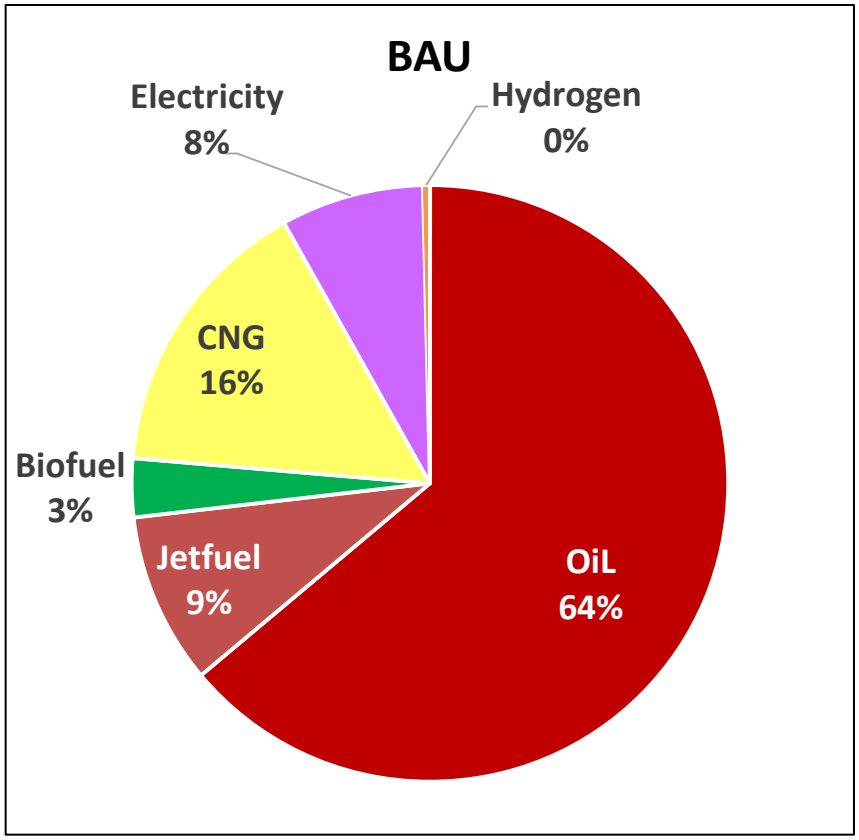
Energy Mix for Transport



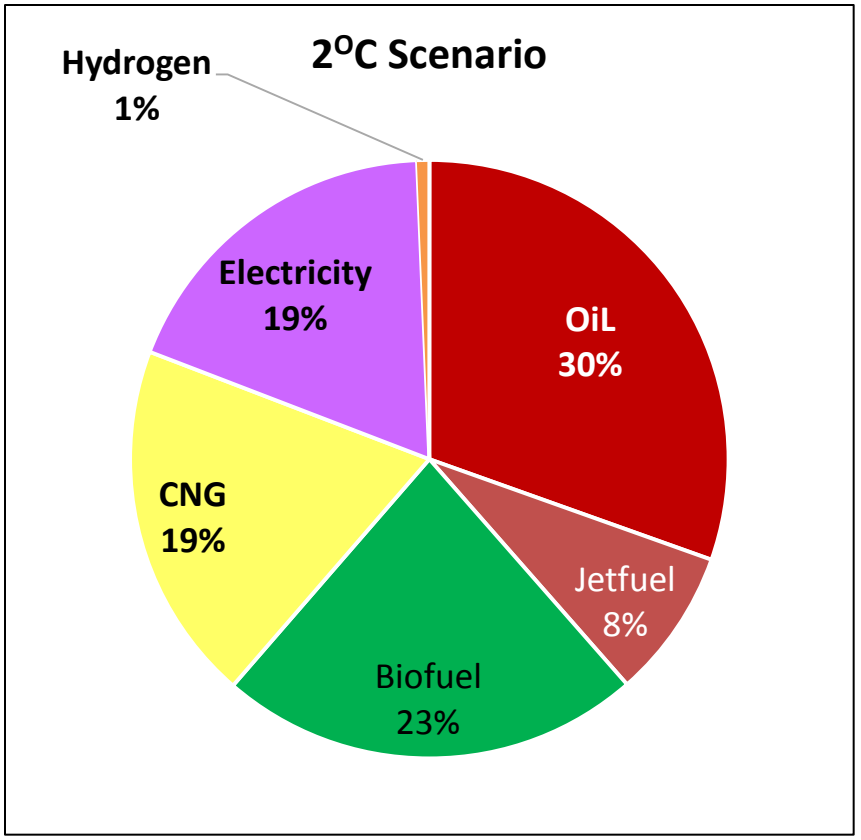


Transport Fuel Mix in 2050

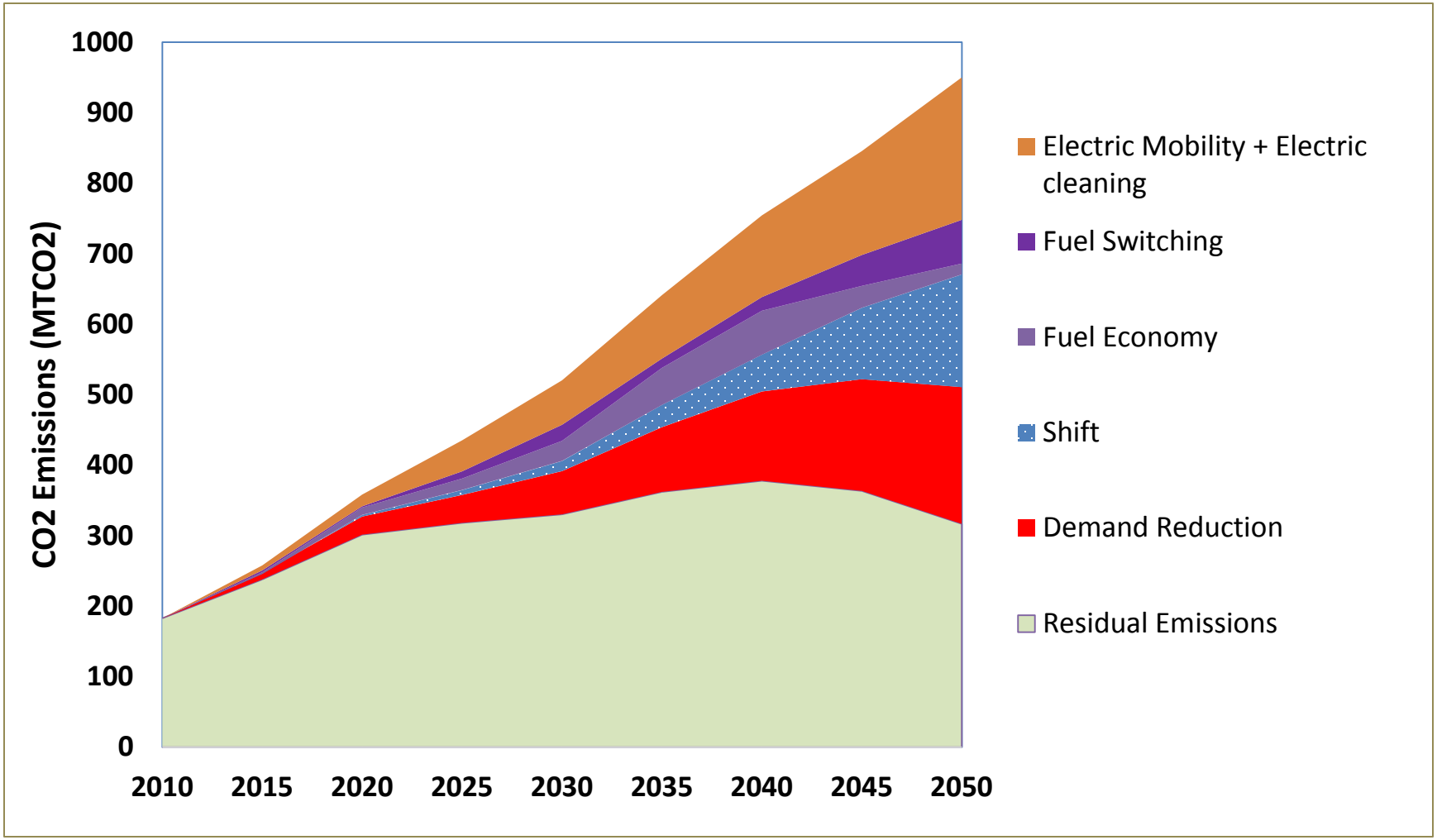
Transport Energy : 299 Mtoe



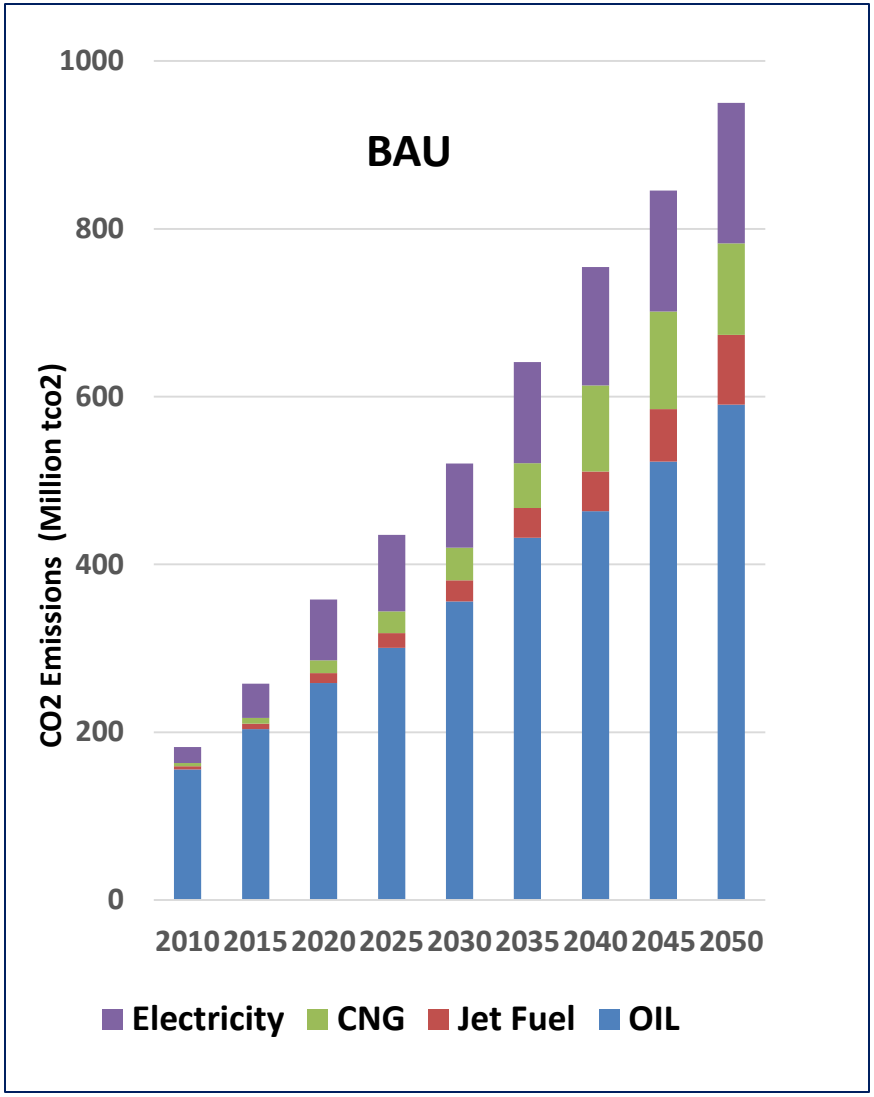
Transport: 169 Mtoe

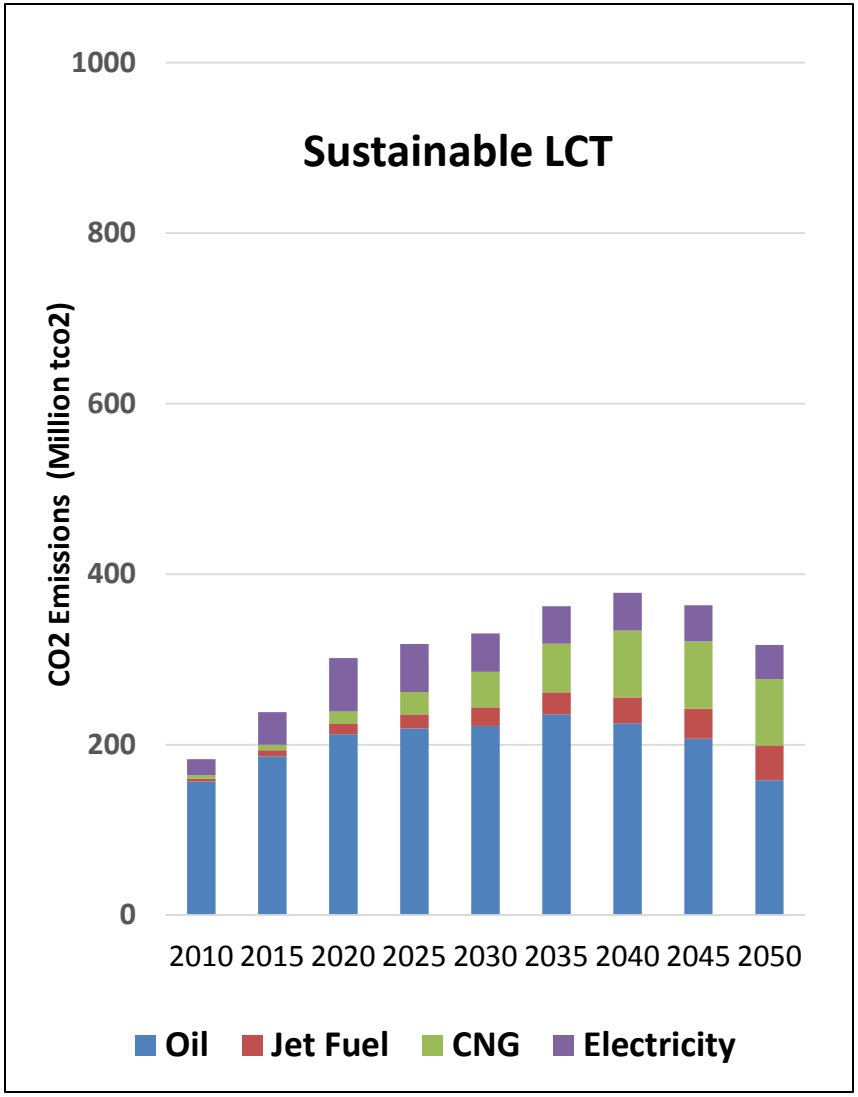


Contribution to CO2 Mitigation in Sustainable Low Carbon Transport Scenario

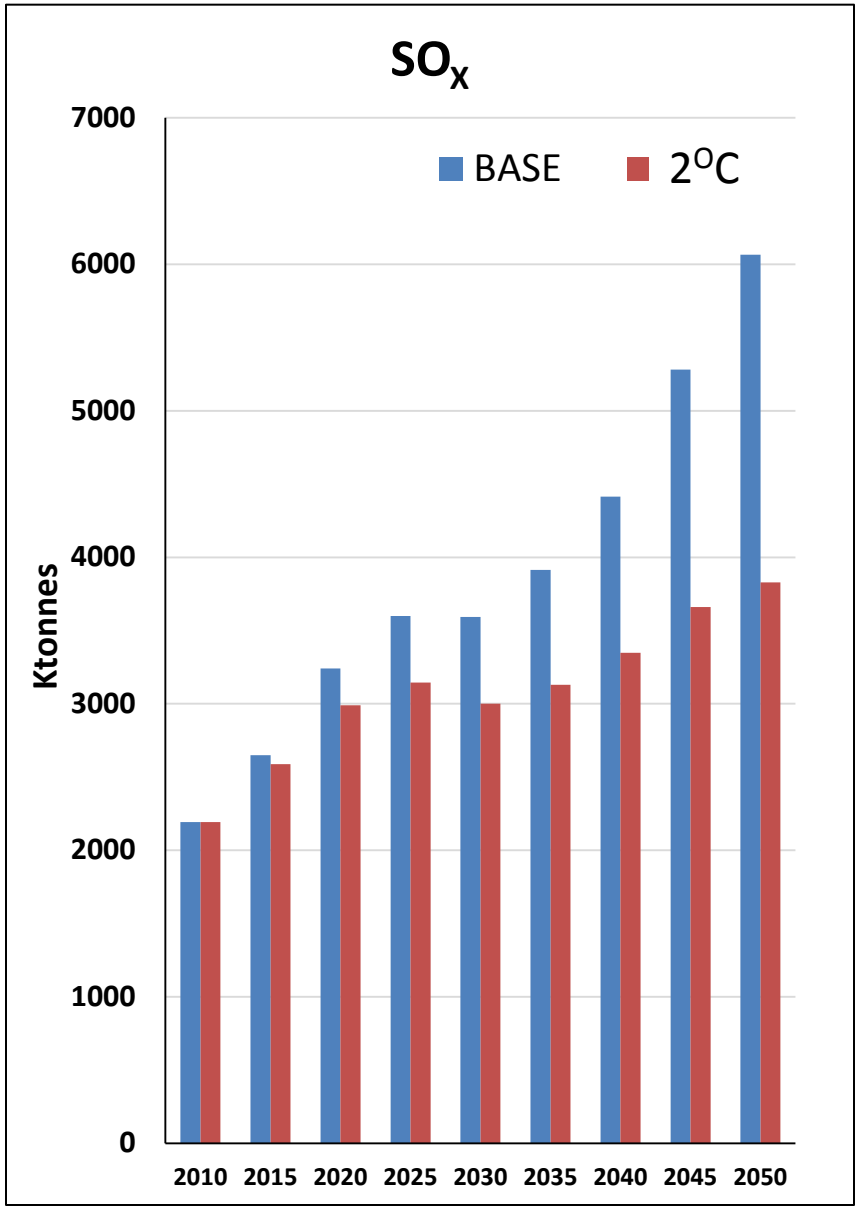


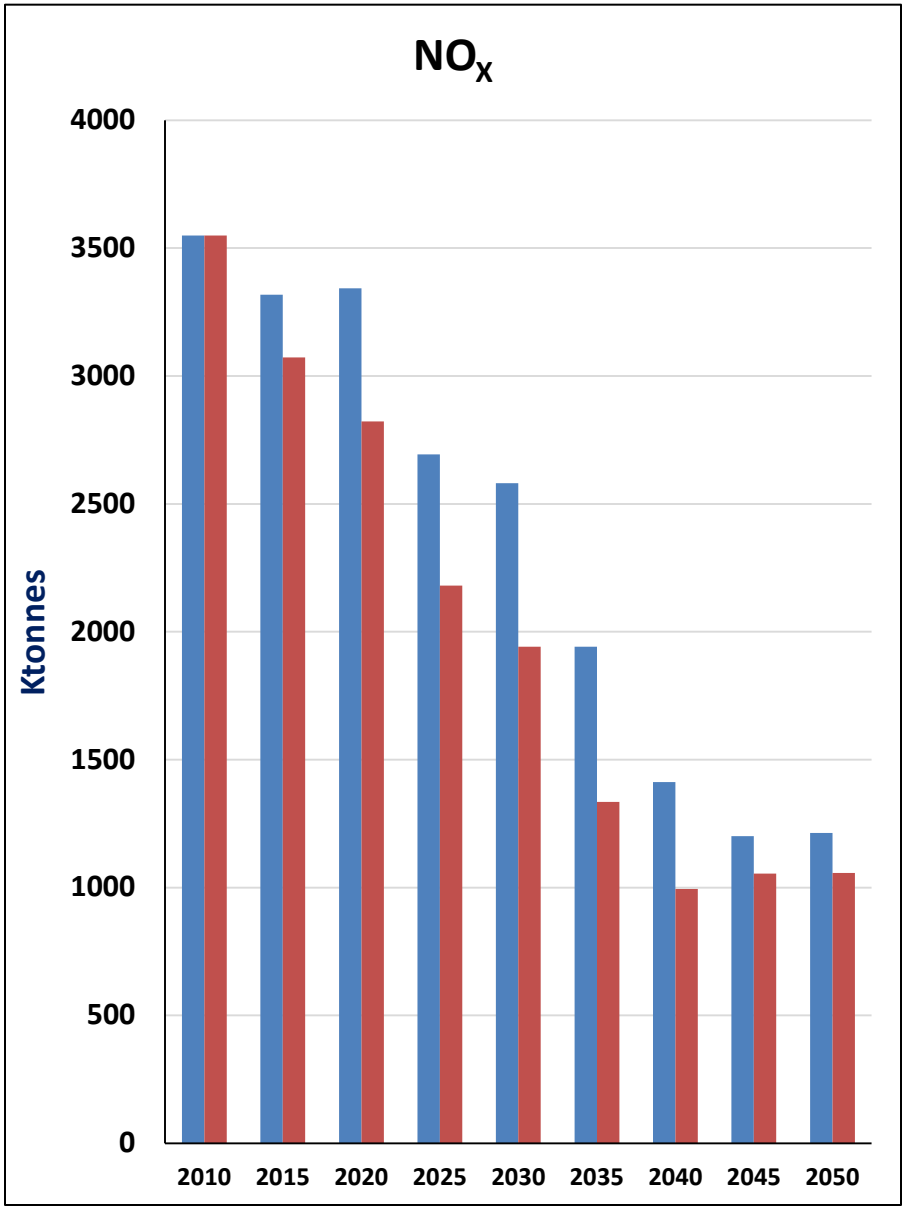
CO2 Emissions- Transport





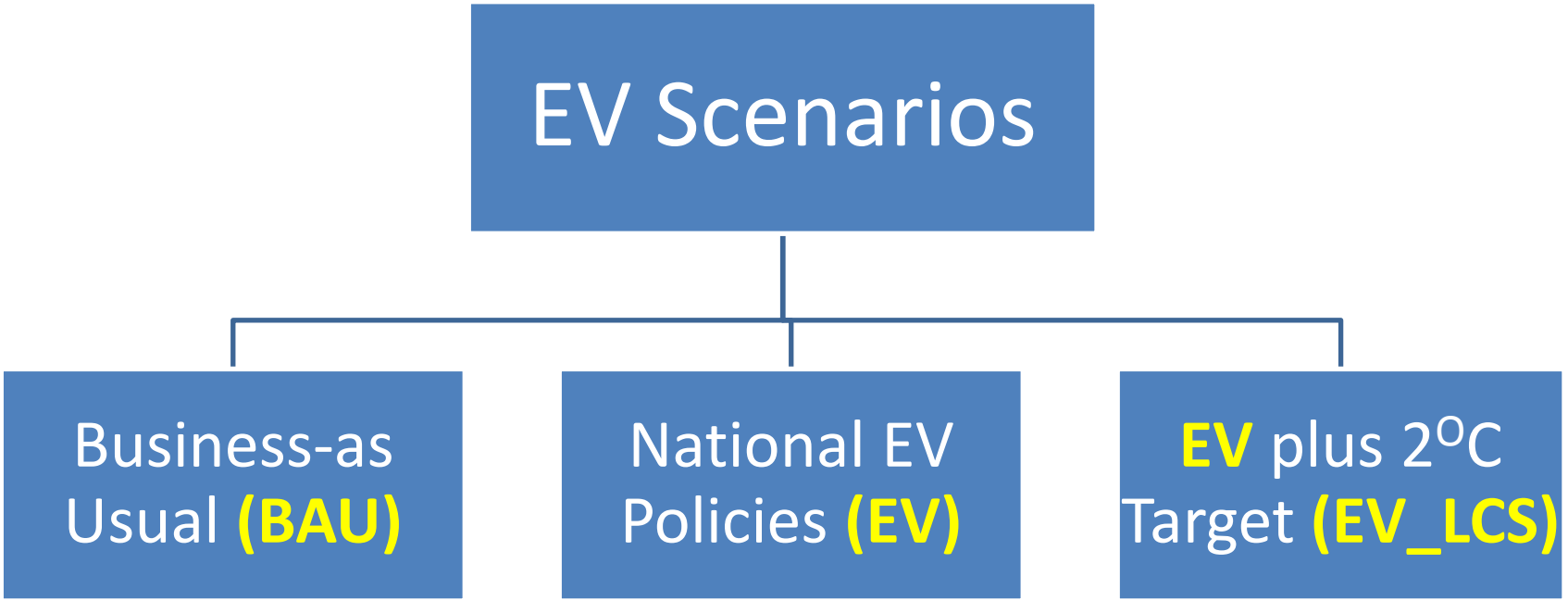
Air Quality Co-benefit





Electric Vehicle Scenarios

Electric Vehicles (EV) Scenarios



Future socio economic development along the conventional path: mirrors resource intensive path of developed countries

Governments recognize multiple co-benefits of EVs (urban air quality; energy security etc.) and push their penetration

Global 2°C climate stabilization target leads to high carbon price; this lowers carbon content of generated electricity

Scenarios Description: EV & EV_LCS

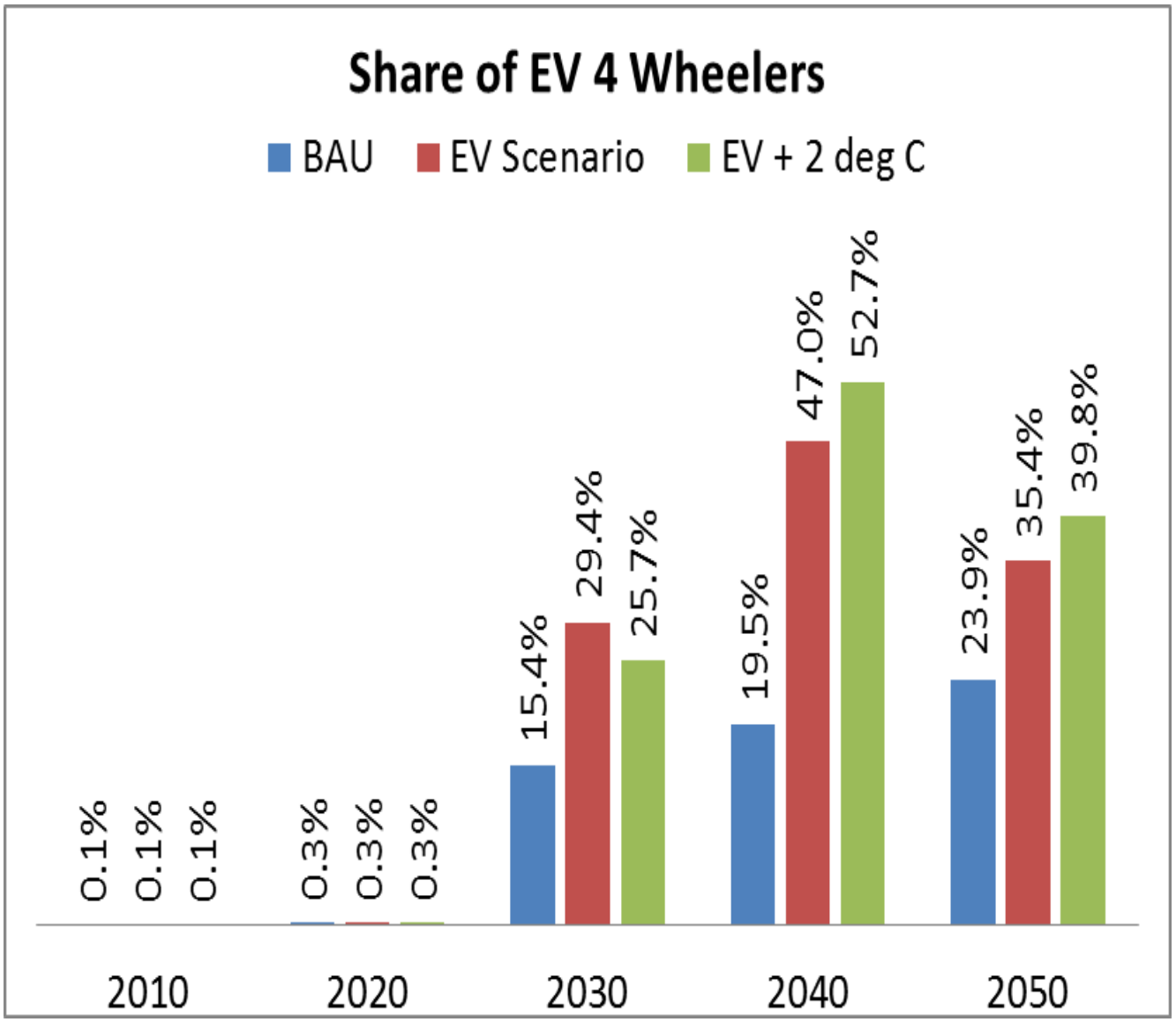
Electric Vehicle Scenario (EV): Assumptions

- Domestic policy supports: Direct capital subsidy, improved charging infrastructure, dedicated lanes, incentives for R&D in power train, batteries and smart grid technologies, quotas for EVs in urban public & goods transport
- Battery costs comes down to half of current costs in next 10-15 years: driven by advancements in battery technologies, improvements in battery capacities, declining component costs, and economies of scale in production
- Improved batteries with higher energy density will also help reduce weight of batteries: further pushing down EVs costs
- Limited range per charge put constraints on EVs penetration for urban transportation

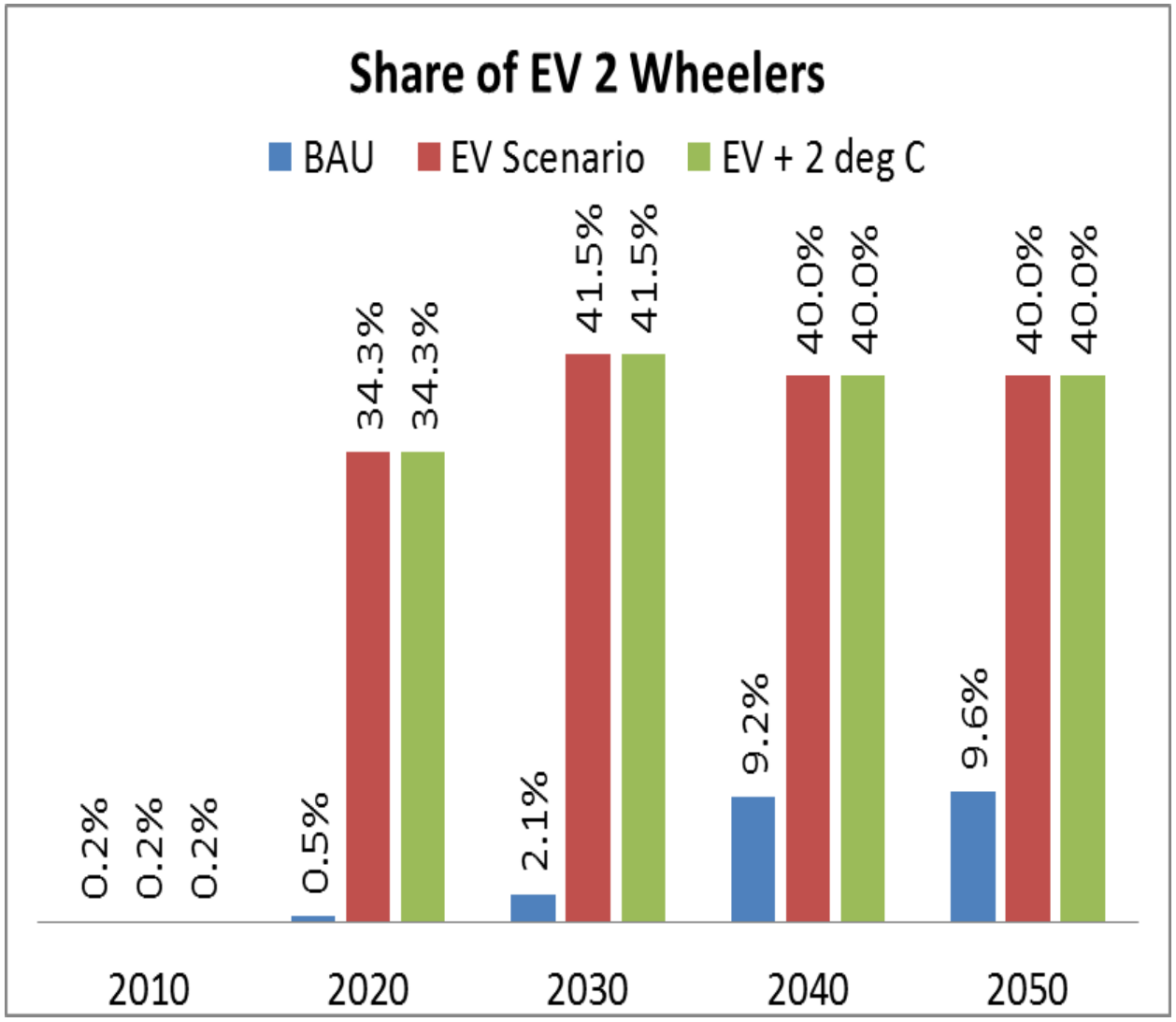
Electric Vehicle plus $2^{O}C$ Scenario (EV_LCS): Assumptions

- Global 450 ppmv CO_2 equivalent concentration stabilization target
- Carbon Price rise: from US$ 46/tonne CO_2 in 2020 to US$ 200/tonne CO_2 in 2050 (based on outputs from IMAGE and MESSAGE models)

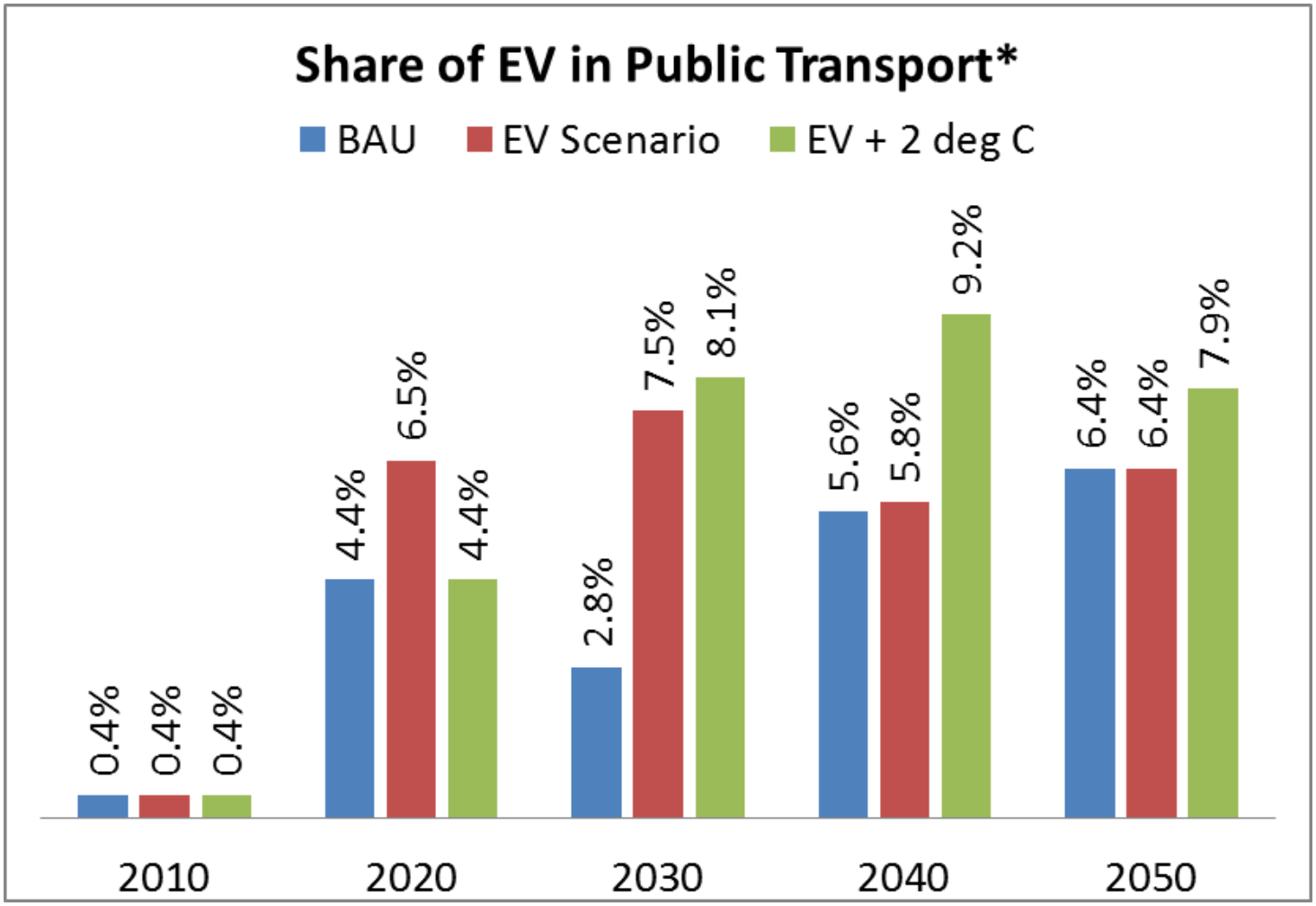
EV Share in Personal Motorised Transport



EV Share in Personal Motorised Transport

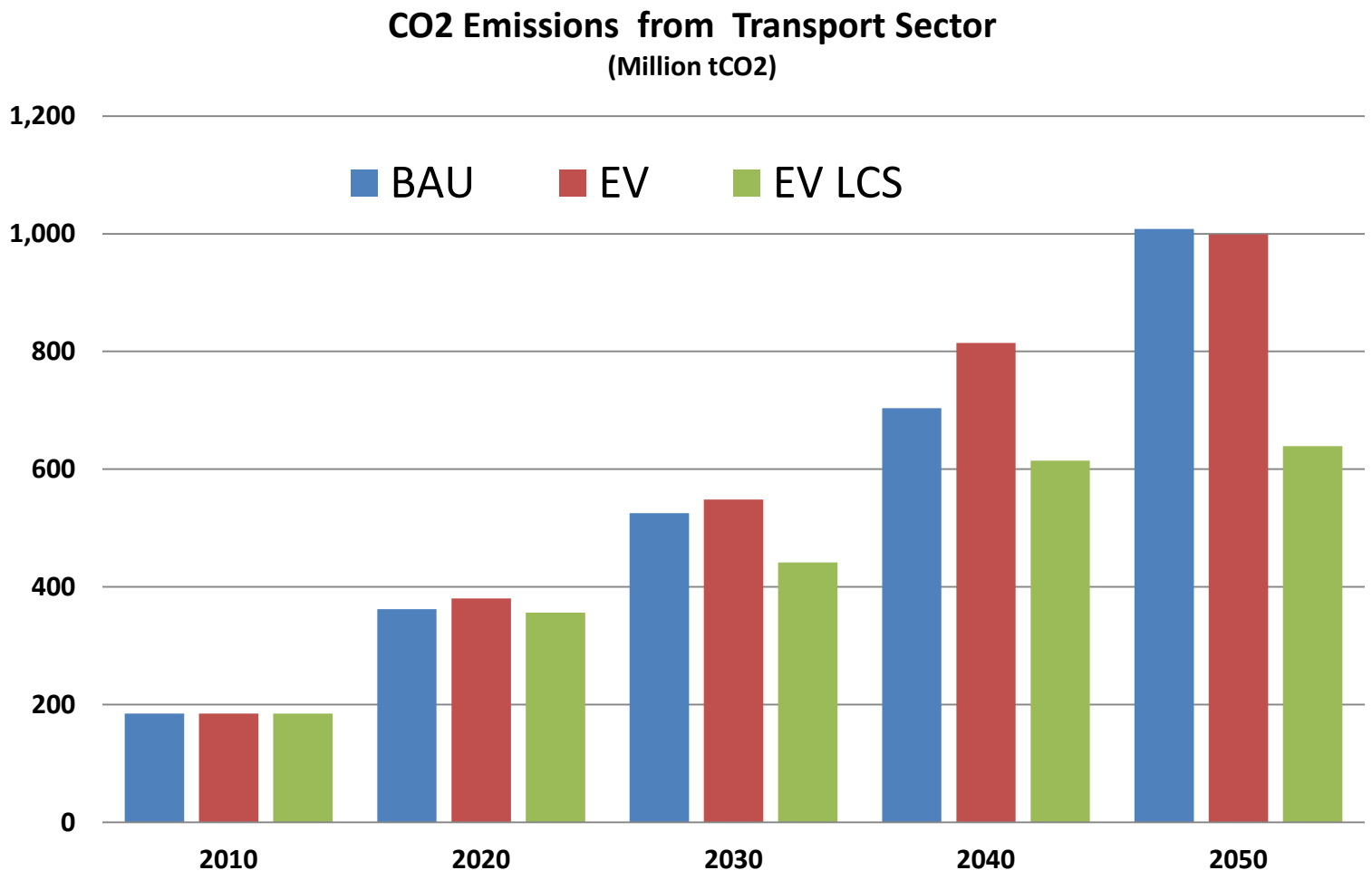


Share of EV for Public transport



(*) Excludes Demand for Passenger Transport met by Railways.

CO2 emissions: BAU, EV, EV_LCS



Conclusions

- Under global 2^{O}C stabilization policy, in 2050, India's:
  - Transport sector would mitigate 66% of BAU emissions
  - Transport Emissions will still be 60% above 2010 emissions
- The low carbon transition of transport sector is accompanied by sizable shift in fuels and technologies
- Low carbon transport transition shall deliver *Air Quality* and *Energy Security* co-benefits
- Electric Vehicles (EV) by themselves do not contribute to CO_2 mitigation; they may even increase emissions
- Under global 2^{O}C stabilization policy, in India, EV contribute sizable mitigation, nearly 38% to the BAU transport emissions in 2050
- Early penetration of EV in India would come through 2-wheelers; this would create infrastructures that would facilitate larger vehicles.

Thank You

Low Carbon Transport Project Website :

www.unep.org/transport/lowcarbon

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